

L8/9

side	DB=USPT; PLUR=YES; OP=ADJ	result set
<u>L8</u>	L1 and ((analyz\$ or monitor\$) with network\$) same ((charg\$ or bill\$) with customer\$ with usage\$)	9 <u>L8</u>
<u>L7</u>	L1 and ((analyz\$ or monitor\$) with network\$) and ((charg\$ or bill\$) with customer\$ with usage\$).ab.	0 <u>L7</u>
<u>L6</u>	L1 and (((analyz\$ or monitor\$) with network\$).ab.) and ((charg\$ or bill\$) with customer\$ with usage\$)	9 <u>L6</u>
<u>L5</u>	L1 and (((analyz\$ or monitor\$) with network\$) and ((charg\$ or bill\$) with customer\$ with usage\$)).ab.	0 <u>L5</u>
<u>L4</u>	L1 and ((analyz\$ or monitor\$) with network\$) and ((charg\$ or bill\$) with customer\$ with usage\$)	86 <u>L4</u>
<u>L3</u>	L1 and ((analyz\$ or monitor\$) with network\$) and ((charg\$ or bill\$) with customer\$)	368 <u>L3</u>
<u>L2</u>	L1 and (analyz\$ and network\$ and charg\$ and customer\$).ab.	0 <u>L2</u>
<u>L1</u>	(705/\$.ccls. or 709/\$.ccls.)	27463 <u>L1</u>

END OF SEARCH HISTORY

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Search Results -

Term	Documents
ANALYZ\$	0
ANALYZ	9
ANALYZA	1
ANALYZABILITY	13
ANALYZABLE	880
ANALYZABLE-NUMBER-OF-TIMES	1
ANALYZAHLE	1
ANALYZAL	1
ANALYZAL-ZEX	1
ANALYZAT	1
ANALYZATE	4
(L1 AND ((ANALYZ\$ OR MONITOR\$) WITH NETWORK\$) SAME ((CHARG\$ OR BILL\$) WITH CUSTOMER\$ WITH USAGE\$)).USPT	9

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L8: Entry 1 of 9

File: USPT

Apr 15, 2003

DOCUMENT-IDENTIFIER: US 6549533 B1

TITLE: Managing switched virtual circuits in a network

Detailed Description Text (7):

Generally, with NMS 214 connected to FR network 200, the system may provision customers, establish SLAs, monitor service requests, and allocate and establish appropriate FR SVCs. During SVC operation, the system may track usage, service levels, bandwidth and costs. After tear down of the FR SVC on completion, the system may log usage, SVC bandwidth utilization, duration and customer use and billing information, and archive and report the information to service providers, managers and customers. By managing the entire process from customer account and SLA establishment, frame relay SVC set up, bandwidth- and SLA-based rule set decision making, and usage information accumulation and reporting, NMS 214 generally provides complete administrative control to the service provider for managing SVCs in a VCS network.

Current US Cross Reference Classification (3):

709/236

Current US Cross Reference Classification (4):

709/238

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US006549533B1

(12) United States Patent
Campbell

(10) Patent No.: US 6,549,533 B1
(45) Date of Patent: Apr. 15, 2003

(54) MANAGING SWITCHED VIRTUAL CIRCUITS IN A NETWORK

(75) Inventor: Walter Blanton Campbell, Granite Bay, CA (US)

(73) Assignee: Objective Systems Integrators, Folsom, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/224,567

(22) Filed: Dec. 30, 1998

(51) Int. Cl.⁷ H04L 12/26; H04J 3/14; G08C 15/00; G06F 11/00; G01R 31/08

(52) U.S. Cl. 370/351; 370/232; 370/395; 370/410; 709/236; 709/238

(58) Field of Search 370/351, 218, 370/237, 393, 397, 410, 471, 474, 409; 379/220, 221, 901; 395/200.68, 200.69, 200.2, 200.11

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Primary Examiner—Wellington Chin

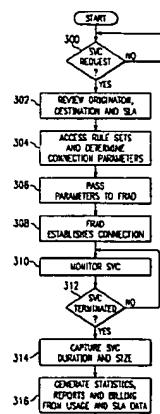
Assistant Examiner—M. Phan

(74) *Attorney, Agent, or Firm*—Fulbright & Jaworski L.L.P.

(57) ABSTRACT

A system and method for managing switched virtual circuits in a virtual circuit switched network. A preferred embodiment method for managing switched virtual circuits comprises determining that a switched virtual circuit has been established in a virtual circuit switched network by a network access device, monitoring the switched virtual circuit while the switched virtual circuit is active, and storing bandwidth and duration information for the switched virtual circuit upon termination of the switched virtual circuit. Another preferred embodiment method comprises receiving a request for establishing the switched virtual circuit from a network access device, generating connection parameters for establishing the switched virtual circuit in the virtual circuit switched network, and sending a reply including the connection parameters to the network access device. A preferred embodiment network management system comprises a network access device gateway having an interface to a network access device in the virtual circuit switched network, a network administrator database connected to the gateway, the database including rules and objects representing characteristics of the virtual circuit switched network, and a rule engine connected to the gateway and having access to the rules and objects in the database. The present invention enables end users to request and use switched virtual circuits and realize the benefits in cost and efficiency over private virtual circuits, and providing service providers with increased bandwidth utilization and improved profitability.

32 Claims, 2 Drawing Sheets



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L8: Entry 2 of 9

File: USPT

Mar 26, 2002

DOCUMENT-IDENTIFIER: US 6363056 B1

TITLE: Low overhead continuous monitoring of network performance

Brief Summary Text (8):

Consider a network operator with N access points provided to a customer. These access points are intermediaries along the path that a packet takes from the customer network. Performance monitoring of the network operation requires monitoring the N.times.(N-1) simplex channels between the pair-wise access points, and determining performance metrics such as delay between these access points. Another useful metric is the determination of the bandwidth that is being used between the different access points. The bandwidth usage is often a component in the price charged to the customer by the operator.

Current US Cross Reference Classification (1):

709/224

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US006363056B1

(12) United States Patent
Beigi et al.

(10) Patent No.: US 6,363,056 B1
(45) Date of Patent: Mar. 26, 2002

(54) LOW OVERHEAD CONTINUOUS MONITORING OF NETWORK PERFORMANCE

(75) Inventors: Mandis Sadr Mohammad Beigi, Tarrytown; Raymond Byars Jennings, Ossining; Dinesh Chandra Verma, Millwood, all of NY (US)

(73) Assignee: International Business Machines Corporation, Armonk, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/115,438

(22) Filed: Jul. 15, 1998

(51) Int. Cl.⁷ H04L 12/28; H04L 12/56

(52) U.S. Cl. 370/252; 709/224

(58) Field of Search 370/241, 242, 370/243, 244, 245, 252, 253, 401, 400; 709/224, 235, 223

(56) References Cited

U.S. PATENT DOCUMENTS

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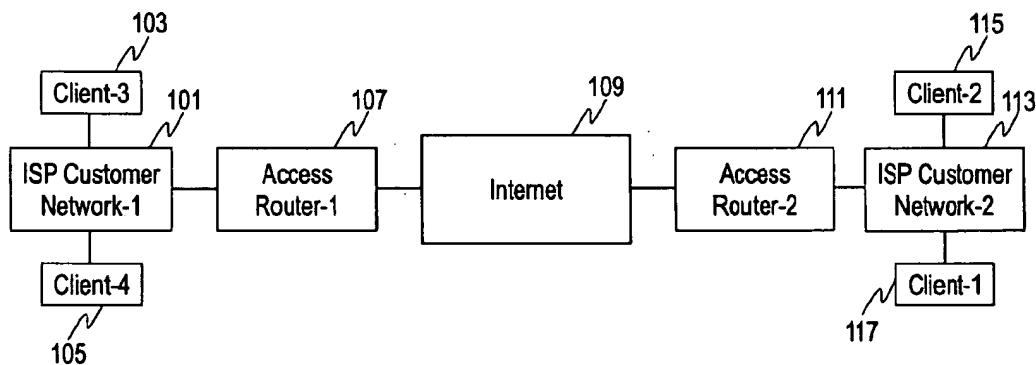
Primary Examiner—Ricky Ngo

(74) Attorney, Agent, or Firm—Louis P Herzberg

(57) ABSTRACT

A method, apparatus, article of manufacture and computer product for low-overhead continuous monitoring of network performance in an intranet or Internet topology. Probe packets are sent from ingress access routers where they are received and processed by egress access routers. Probe packets are generated by copying every Nth packet being sent by an ingress access router. In the event an access router does not receive the probe packet, the probe packet is discarded through normal network delivery mechanisms. Network delay is determined by subtracting the time that a probe packet was received with the time stamp enclosed in the probe packet. Round trip time is established by reflecting the probe packet back to the originating access router and computing the round trip time. Bandwidth monitoring is achieved by using the number of probe packets received to estimate the expected amount of network traffic to be received. Fault monitoring is accomplished by comparing the number of probe packets received with the number of actual packets received. When the low overhead mechanisms indicate that network delays or faults exist, a heavy weight monitoring protocol is started between two access routers in question.

70 Claims, 12 Drawing Sheets



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L8: Entry 3 of 9

File: USPT

May 29, 2001

DOCUMENT-IDENTIFIER: US 6240402 B1

TITLE: Charge allocation in a multi-user network

Brief Summary Text (5):

Where the network has some means of controlling customer access (access control) to the network then this same mechanism can also be used to monitor, and hence charge for, customers' usage of the network. A network incorporating access control means is shown schematically in FIG. 1. Users access the network designated generally as 1 via one of a plurality of terminals 2 all of which are connected to the network backbone 3. Each terminal 2 accesses the network backbone 3 via a respective access control 4. In the example shown the access control 4 is terminal-specific and can be arranged to record charging data such as call length, call type and/or call duration and ensure that the charge is attributed to the associated terminal 2.

Current US Original Classification (1):

705/400

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US006240402B1

(12) **United States Patent**
Lynch-Aird

(10) Patent No.: **US 6,240,402 B1**
(45) Date of Patent: **May 29, 2001**

(54) **CHARGE ALLOCATION IN A MULTI-USER NETWORK**

(75) Inventor: Nicolas James Lynch-Aird,
Stowmarket (GB)

(73) Assignee: British Telecommunications public
limited company, London (GB)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/029,900**

(22) PCT Filed: **Mar. 26, 1997**

(86) PCT No.: **PCT/GB97/00842**

§ 371 Date: **Mar. 11, 1998**

§ 102(e) Date: **Mar. 11, 1998**

(87) PCT Pub. No.: **WO97/37462**

PCT Pub. Date: **Oct. 9, 1997**

(30) **Foreign Application Priority Data**

Mar. 29, 1996 (GB) 9606622
Jan. 9, 1997 (GB) 9700365

(51) Int. Cl.⁷ **G06F 17/60**

(52) U.S. Cl. **705/400; 379/114**

(58) Field of Search 379/111, 114;
705/1, 30, 34, 52, 53, 59, 400, 418

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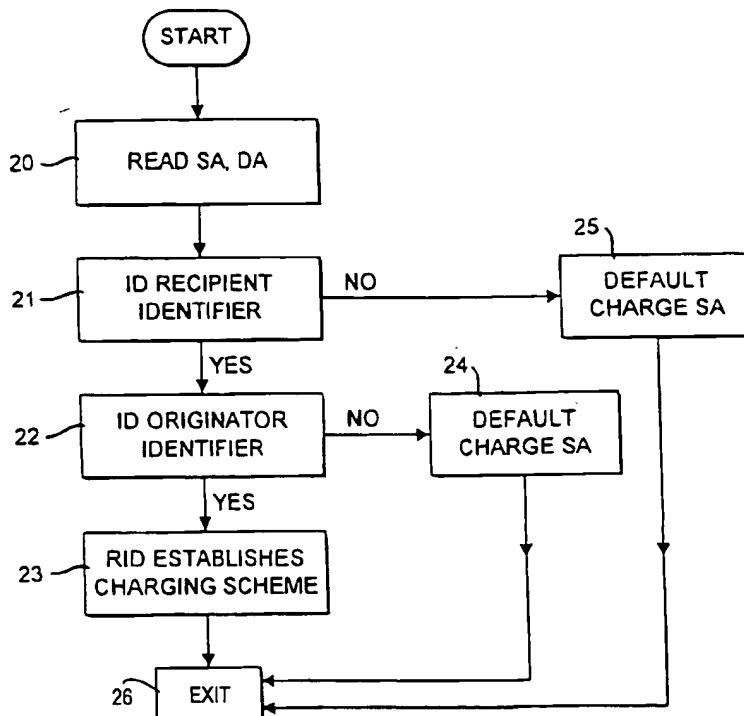
Primary Examiner—Edward R. Cosimano

(74) Attorney, Agent, or Firm—Nixon & Vanderhye P.C.

(57) **ABSTRACT**

A communication network includes a communication monitoring point arranged to monitor user identifiers in source/destination identifier fields to determine a charging scheme.

20 Claims, 5 Drawing Sheets



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L8: Entry 4 of 9

File: USPT

Jan 9, 2001

DOCUMENT-IDENTIFIER: US 6173326 B1

TITLE: Broadband communications network services access platform

Brief Summary Text (17):

There have been attempts in the prior art at monitoring data network system usage at the customer's premises to aid in building databases typically used for billing the end-user. One monitoring method, utilized specifically in the television industry, identifies a local oscillator signal and its harmonic radiation and/or propagation which thus identifies the particular frequency being used by the end-user. This method and an apparatus to accomplish the same is disclosed in U.S. Pat. No. 4,723,302 to Fulmer et al., which is incorporated herein by reference. The local oscillator signal, however, is a parasitic effect of a television and essentially an undesired result. Consequently, future televisions will eventually eliminate it, thus rendering such methods of detection obsolete and unusable.

Current US Original Classification (1):

709/229

Current US Cross Reference Classification (1):

709/220

Current US Cross Reference Classification (2):

709/250

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US006173326B1

(12) **United States Patent**
Collins

(10) **Patent No.:** US 6,173,326 B1
(45) **Date of Patent:** Jan. 9, 2001

(54) **BROADBAND COMMUNICATIONS NETWORK SERVICES ACCESS PLATFORM**

(76) Inventor: Francis R. Collins, 176 Rangeley Rd., Chestnut Hill, MA (US) 02167

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: 09/039,462

(22) Filed: Mar. 16, 1998

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Primary Examiner—Mehmet B. Geckil

(74) *Attorney, Agent, or Firm*—Mirick O'Connell DeMalie and Lougee, LLP

(57) **ABSTRACT**

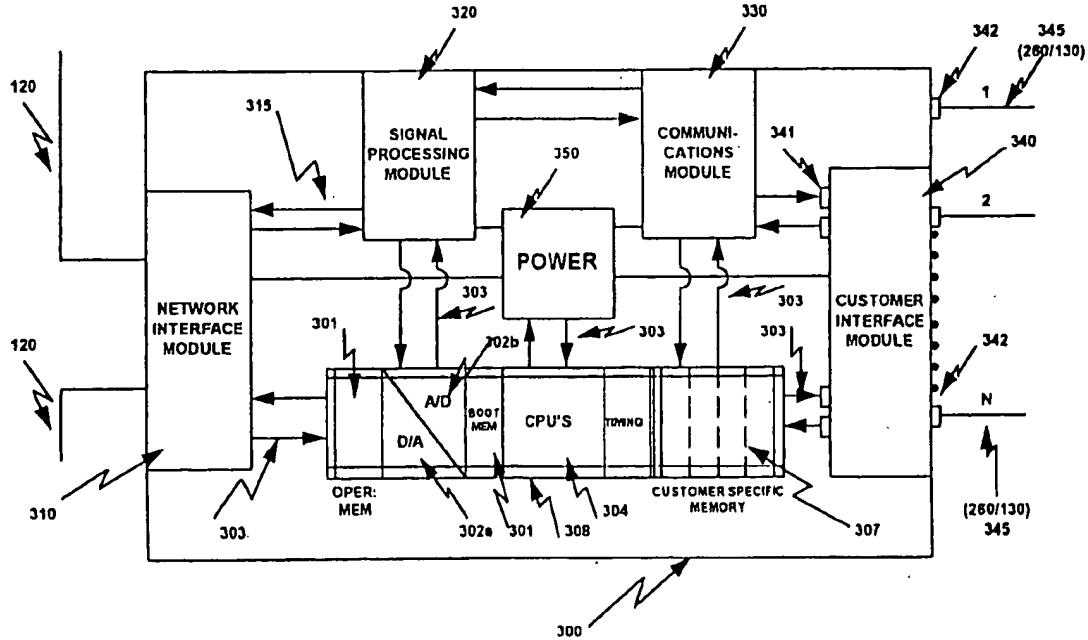
A system for controlling access to, service transmission from, and use of an information transmission network which provides an end-user with at will access to the broadband/narrowband service networks deployed in the cable television industry, telephone industry, the multi-media information/services network technology, and the video dial tone industry. Allows the end-user to control the type of services to which such end-user has access to. Network service providers have the ability to provide targeted commercials. Independent interfaced subsystems are combined to yield the network services access system.

32 Claims, 8 Drawing Sheets

(56) **References Cited**

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4,689,619	8/1987	O'Brien, Jr.	340/825.08
4,723,302	2/1988	Fulmer et al.	455/2
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L8: Entry 5 of 9

File: USPT

Aug 31, 1999

DOCUMENT-IDENTIFIER: US 5946302 A

TITLE: System and method for response time measurement in high speed data transmission networks

Brief Summary Text (5):

In many communications environments, billing customers for network usage is important, particularly the ability of a network to respond to a transaction in a timely manner. For example, a workstation could be part of a business where customers come in to make airline reservations. It is important that the reservation request receive a prompt response from a central processing center. Not only is the return information important to the customer, the response time is important to the system operator to provide an efficient dispatching of the requests. Moreover, service agreements between travel agencies and reservation systems require a quality of service and timely network response. A system and method which monitors in real time the response time characteristics of the data processing environment will provide information on the quality of service provided by the network. Also, the information can assist in establishing a better path through the communications network or more efficient dispatching of applications at the host to meet service agreement requirements.

Current US Cross Reference Classification (2):

709/224

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US005946302A

United States Patent [19]

Waclawsky et al.

[11] Patent Number: 5,946,302

[45] Date of Patent: Aug. 31, 1999

[54] **SYSTEM AND METHOD FOR RESPONSE TIME MEASUREMENT IN HIGH SPEED DATA TRANSMISSION NETWORKS**5,526,488 6/1996 Hershey et al. 395/200.72
5,590,116 12/1996 Zhang 370/252[75] Inventors: John G. Waclawsky, Frederick, Md.;
Paul C. Hershey, Manassas, Va.

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[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

5108026 2/1954 Japan .
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6179341 4/1996 Japan .

[21] Appl. No.: 09/054,127

Primary Examiner—Chi H. Pham
Assistant Examiner—Frank Duong
Attorney, Agent, or Firm—John D. Flynn; Morgan & Finnegan

[22] Filed: Apr. 2, 1998

Related U.S. Application Data

[62] Division of application No. 08/496,622, Jun. 29, 1995, Pat. No. 5,802,302.

[51] Int. Cl. 6 G06F 13/00

[52] U.S. Cl. 370/252; 370/253; 395/200.54

[58] Field of Search 370/252, 253; 395/853, 854, 200.54

[56] References Cited

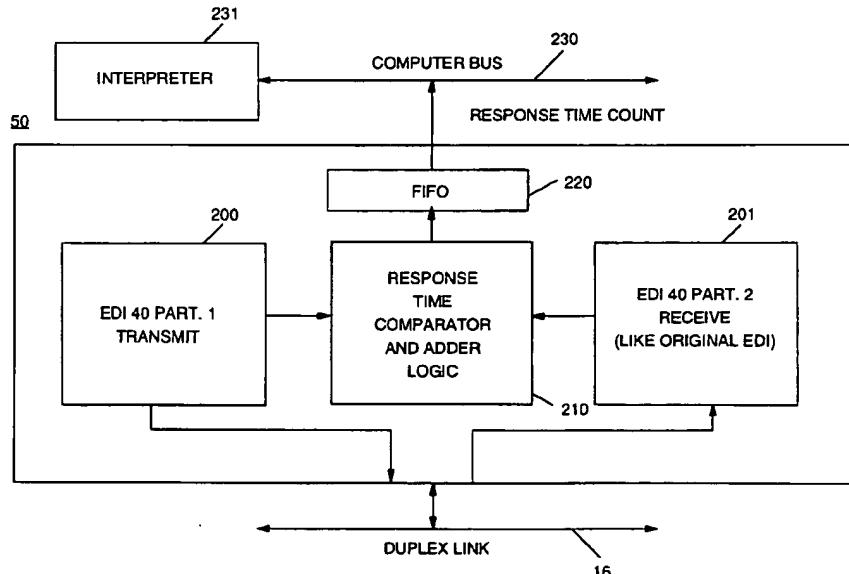
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5,375,070	12/1994	Hershey et al.	364/550

[57] ABSTRACT

A high speed data communication network is adapted to monitor and measure response time between a work station and a central host or processor coupled to the data communications network through a media, such as token ring, FDDI, Ethernet, etc. As the workstation communicates with the processor, a flag is set in a packet transmitted to the processor. The packet traverses the network to an application in the processor and a response returns which includes a flag. Each flag is a specific bit pattern. A programmable digital filter recognizes the flags and counts the number of bits on the network between the flags in the forward and reverse direction. By counting the bits on the media, when the flag moves in one direction or another, the total number of bits transmitted on the media between the two intervening flags is determined. The media speed is used as a clock. The number of bits counted divided by the media speed determines the response time with fine resolutions. All of the measurements are done in near real time without the use of clocks or off-line processing of data to determine response time. The measurements can be done for half duplex or full duplex operation of a network. The measurements can be also used in the network to initiate performance changes according to the response time.

5 Claims, 3 Drawing Sheets



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L8: Entry 6 of 9

File: USPT

Jan 19, 1999

DOCUMENT-IDENTIFIER: US 5862324 A

TITLE: Broadband communications network services access platform

Brief Summary Text (17):

There have been attempts in the prior art at monitoring data network system usage at the customer's premises to aid in building databases typically used for billing the end-user. One monitoring method, utilized specifically in the television industry, identifies a local oscillator signal and its harmonic radiation and/or propagation which thus identifies the particular frequency being used by the end-user. This method and an apparatus to accomplish the same is disclosed in U.S. Pat. No. 4,723,302 to Fulmer et al., which is incorporated herein by reference. The local oscillator signal, however, is a parasitic effect of a television and essentially an undesired result. Consequently, future televisions will eventually eliminate it, thus rendering such methods of detection obsolete and unusable.

Current US Original Classification (1):

709/220

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US005862324A

United States Patent [19]

Collins

[11] Patent Number: 5,862,324

[45] Date of Patent: Jan. 19, 1999

[54] BROADBAND COMMUNICATIONS
NETWORK SERVICES ACCESS PLATFORM[76] Inventor: Francis R. Collins, 176 Rangeley Rd.,
Chestnut Hill, Mass. 02167

[21] Appl. No.: 294,490

[22] Filed: Aug. 23, 1994

[51] Int. Cl. 6 G06F 13/00

[52] U.S. Cl. 395/200.5; 348/7; 348/12

[58] Field of Search 348/7-12; 395/200.5;
379/93

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4,752,954	6/1988	Masuko	348/1
4,961,109	10/1990	Tanaka	348/3
5,091,937	2/1992	Kawasaki	455/2
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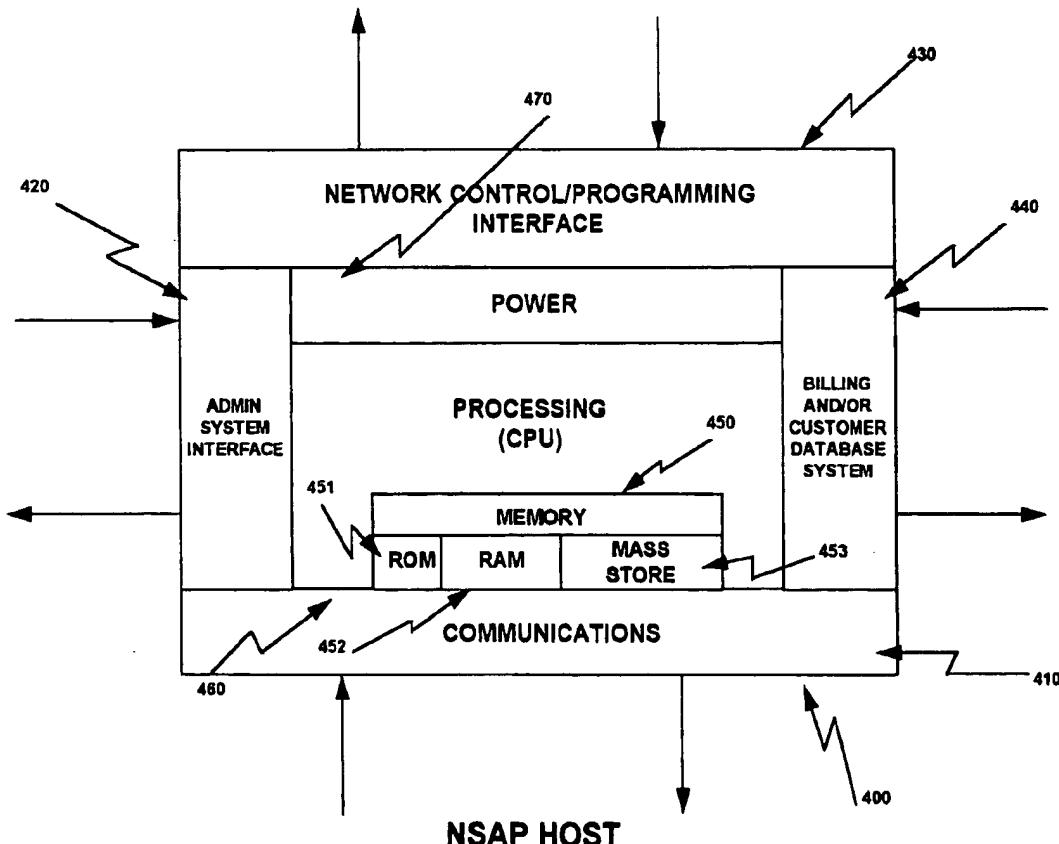
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5,289,271	2/1994	Watson	348/1
5,361,091	11/1994	Hoarty et al.	348/7
5,414,455	5/1995	Hooper et al.	348/7

Primary Examiner—Mehmet B. Geckil
Attorney, Agent, or Firm—Brian M. Dingman

[57] ABSTRACT

A system for controlling access to, service transmission from, and use of an information transmission network which provides an end-user with at will access to the broadband/narrowband service networks deployed in the cable television industry, telephone industry, the multi-media information/services network technology, and the video dial tone industry. Allows the end-user to control the type of services to which such end-user has access to. Network service providers have the ability to provide targeted commercials. Independent interfaced subsystems are combined to yield the network services access system.

12 Claims, 8 Drawing Sheets



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L8: Entry 7 of 9

File: USPT

Sep 1, 1998

DOCUMENT-IDENTIFIER: US 5802302 A

TITLE: System and method for response time measurement in high speed data transmission networks

Brief Summary Text (5):

In many communications environments, billing customers for network usage is important, particularly the ability of a network to respond to a transaction in a timely manner. For example, a workstation could be part of a business where customers come in to make airline reservations. It is important that the reservation request receive a prompt response from a central processing center. Not only is the return information important to the customer, the response time is important to the system operator to provide an efficient dispatching of the requests. Moreover, service agreements between travel agencies and reservation systems require a quality of service and timely network response. A system and method which monitors in real time the response time characteristics of the data processing environment will provide information on the quality of service provided by the network. Also, the information can assist in establishing a better path through the communications network or more efficient dispatching of applications at the host to meet service agreement requirements.

Current US Original Classification (1):

709/224

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US005802302A

United States Patent [19]
Waclawsky et al.

[11] Patent Number: 5,802,302
[45] Date of Patent: Sep. 1, 1998

[54] SYSTEM AND METHOD FOR RESPONSE TIME MEASUREMENT IN HIGH SPEED DATA TRANSMISSION NETWORKS

[75] Inventors: John G. Waclawsky, Frederick, Md.; Paul C. Hershey, Manassas, Va.

[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

[21] Appl. No.: 496,622

[22] Filed: Jun. 29, 1995

[51] Int. Cl. 6 G06F 13/00; G06F 11/30

[52] U.S. Cl. 395/200.54; 395/184.01; 370/252; 364/551.01

[58] Field of Search 364/514 B, 551.01, 364/569; 340/825.65; 370/252, 253; 395/184.01, 200.11, 200.54, 200.64

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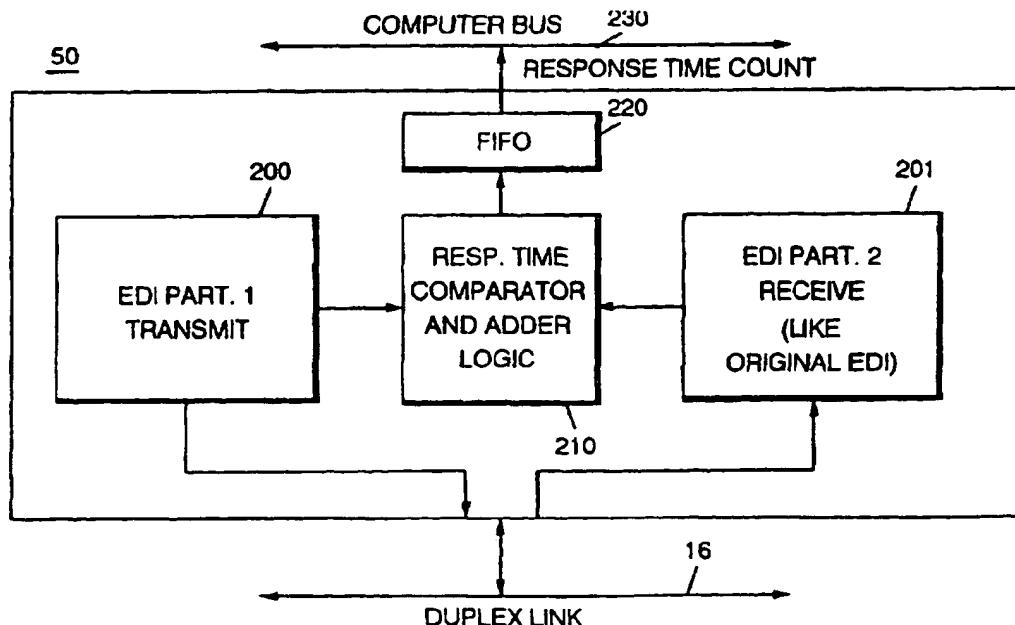
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Primary Examiner—Mark H. Rinehart
Attorney, Agent, or Firm—John D. Flynn; Morgan & Finnegan

[57] ABSTRACT

A high speed data communication network is adapted to monitor and measure response time between a work station and a central host or processor coupled to the data communications network through a media, such as token ring, FDDI, Ethernet, etc. As the workstation communicates with the processor, a flag is set in a packet transmitted to the processor. The packet traverses the network to an application in the processor and a response returns which includes a flag. Each flag is a specific bit pattern. A programmable digital filter recognizes the flags and counts the number of bits on the network between the flags in the forward and reverse direction. By counting the bits on the media, when the flag moves in one direction or another, the total number of bits transmitted on the media between the two intervening flags is determined. The media speed is used as a clock. The number of bits counted divided by the media speed determines the response time with fine resolutions. All of the measurements are done in near real time without the use of clocks or off-line processing of data to determine response time. The measurements can be done for half duplex or full duplex operation of a network. The measurements can be also used in the network to initiate performance changes according to the response time.

13 Claims, 2 Drawing Sheets



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L8: Entry 8 of 9

File: USPT

Sep 17, 1996

DOCUMENT-IDENTIFIER: US 5557746 A

TITLE: System and method for recording accounting times

Brief Summary Text (10):

The Manager is responsible for, among other things, monitoring network performance and status, controlling operational parameters, and reporting, analyzing and isolating faults in its managed domain. Furthermore, the Manager must maintain accounting data of the activity in its managed domain for customer billing, performance analysis, capacity planning and problem determination. In order to effectively accomplish these functions, the Manager requires precise and timely accounting data, including data related to time, regarding the network activity from the nodes in the network. In particular, there are many types of data in which an accurate TIME record is required. For example, in order for a network administrator to accurately bill a customer for the customer's network usage, the network administrator must know the length of time that the customer used the network as well as the time of day (and day of the week), i.e., calendar time, as usage rates may vary accordingly.

Current US Original Classification (1):

709/202

[Previous Doc](#) [Next Doc](#) [Go to Doc#](#)



US005557746A

United States Patent [19]

Chen et al.

[11] Patent Number: **5,557,746**
 [45] Date of Patent: **Sep. 17, 1996**

[54] SYSTEM AND METHOD FOR RECORDING ACCOUNTING TIMES

[75] Inventors: **David D. Chen, Cary; John L. Eisenbies, Raleigh; William F. McKenzie, Jr., Raleigh; Leo Temoshenko, Raleigh, all of N.C.**

[73] Assignee: **International Business Machines Corporation, Armonk, N.Y.**

[21] Appl. No.: **123,547**

[22] Filed: **Sep. 20, 1993**

[51] Int. Cl.⁶ **G06F 15/00**

[52] U.S. Cl. **395/200.06; 364/222; 364/225.1; 364/249.94; 364/282.1; 364/284.4; 364/DIG. 1**

[58] Field of Search **395/200, 200.06; 364/464.01, 464.04; 464/467**

[56] References Cited**U.S. PATENT DOCUMENTS**

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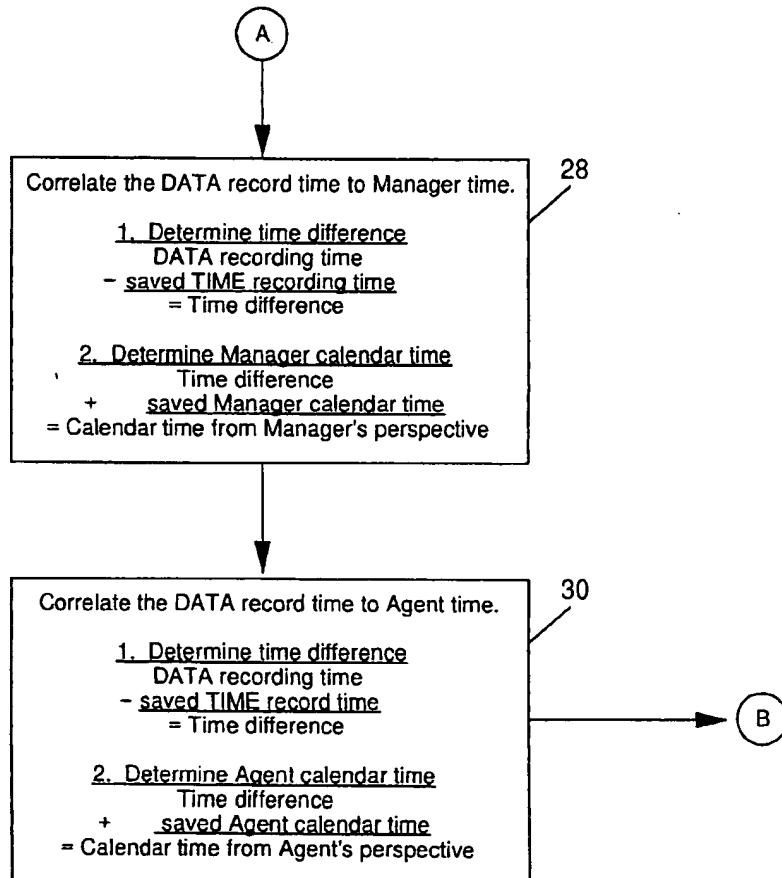
5,239,576 8/1993 Yoshida et al. 379/355

Primary Examiner—Kevin J. Teska
 Assistant Examiner—Ayni Mohamed
 Attorney, Agent, or Firm—Stephen T. Keohane

[57] ABSTRACT

A system and method for recording accounting times by an Agent in a network and retrieving the accounting times by the network Manager. Three types of data objects in each of the Agent's stored records are provided. Record Number is the sequence number of the record in the file. Recording time is an indication of the time the record was stored in the file since a certain point in time, such as after the Agent's clock began running. Record Type is the particular type of record stored. The Record Type can either be DATA representing normal accounting data or TIME representing time data used for correlating the Manager's and the Agent's time-keeping. Upon receipt of an accounting data record of type DATA, the manager uses the record's Recording time to help determine the point of time accorded to that event. The Manager then uses the previous record of type TIME to adjust the Recording time of the received accounting data record relative to the Manager's precise calendar time.

23 Claims, 7 Drawing Sheets



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L8: Entry 9 of 9

File: USPT

Mar 23, 1993

DOCUMENT-IDENTIFIER: US 5197002 A

TITLE: Methods and apparatus for dynamic hashing

Detailed Description Text (3):

Graph
00

If the data packet transmission network of FIG. 1 is provided by a common carrier, or if shared use of the network is contemplated, then it is necessary to assign the costs of building and maintaining the network to a plurality of users in some way which is considered fair and reasonable to those users. One such method of assigning costs is called usage sensitive billing. In usage sensitive billing, each user is monitored to determine how much use that user makes of the network, and the user is then billed proportionally to that usage. The normal elements of usage are the number of message packets delivered by the network, the length of those delivered message packets, and the length of the route over which the delivered message packets must travel in order to reach the desired destination. If each of the packet switches of network 14 creates a billing record when packets are delivered, and if that billing record includes the source address, the destination address and a count of the number of packets delivered, then usage sensitive billing records can be constructed from those billing records. The format of a typical billing record is shown in FIG. 2. In FIG. 1, it is assumed that the one of packet switches 10-13 which is connected to the destination station generates the billing record after delivering the message packet to the proper destination. All of these billing records are delivered to a common billing system 19 where usage charges can be accumulated for each of the customers of the network 14. A single billing record, or a plurality of such billing records, can be formatted as a standard message packet and launched on the packet switching network 14 of FIG. 1 with a destination of billing system 19. Alternatively, if the billing message packets might overload the capacity of the switching network 14, these billing records can be delivered to billing system 19 by separate dedicated transmission facilities. In any event, a very large number of billing records are delivered to billing system 19, which records must be processed in real time without loss of any records. Techniques for the rapid processing of large numbers of records in real time is the subject matter of this invention.

Current US Original Classification (1):

705/34

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US005197002A

United States Patent [19]

Spencer

[11] Patent Number: 5,197,002

[45] Date of Patent: Mar. 23, 1993

[54] METHODS AND APPARATUS FOR DYNAMIC HASHING

[75] Inventor: Paul A. Spencer, Highland Park, N.J.

[73] Assignee: Bell Communications Research, Inc., Livingston, N.J.

[21] Appl. No.: 455,264

[22] Filed: Dec. 22, 1989

[51] Int. Cl. 5 G06F 15/21; G06F 15/40

[52] U.S. Cl. 364/406; 395/400; 395/425; 395/600

[58] Field of Search 364/401, 406, 408; 395/400, 425, 20, 600

[56] References Cited

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Primary Examiner—Roy N. Envall, Jr.

Assistant Examiner—David Huntley

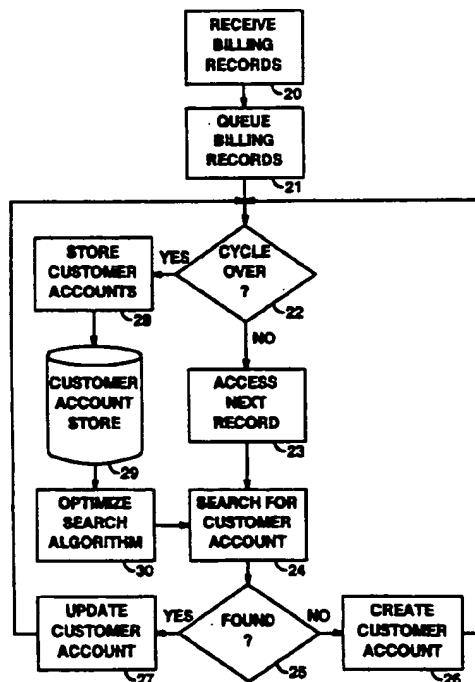
Attorney, Agent, or Firm—Leonard Charles Suchyta; James W. Falk

[57] ABSTRACT

A system is disclosed for processing billing records in a data packet transmission network by optimizing the search algorithm for accessing customer records. Using hashing techniques, the hashing parameters of hashing key and modulus base of the modulo arithmetic are varied to optimize the hashing function for recently received billing records. These optimum parameters are then used predictively to hash the next batch of billing records. In a preferred embodiment, the billing records are queued in two ping-pong memories and the contents of one are used to drive the optimizer while the contents of the other are used to drive the billing procedure.

6 Claims, 5 Drawing Sheets

BILLING PROCEDURE



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<u>L2</u>	L1 and (analyz\$ with network\$ with (volume or flow\$))	85	<u>L2</u>
<u>L1</u>	(709/\$.ccls.)	17919	<u>L1</u>

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L4: Entry 1 of 19

File: USPT

May 17, 2005

DOCUMENT-IDENTIFIER: US 6895438 B1

TITLE: Telecommunication-based time-management system and method

Abstract Text (1):

A proxy-server system (15) connected preferably to a computer-telephone system (10) intercepts, processes, and analyzes as traffic-analysis results (68A-C) all forms of real- and non-real-time electronic communication passing over the network in the form of raw traffic data (61). The proxy-server system normalizes each communication into the measure of time needed by recipient(s) of the communication to understand the information contained therein. Once normalized, the data may be aggregated into summary reports (69A-C). As part of the analysis, the aggregated communication records are compared with user-defined rules to provide alerts if the individual or aggregated durations exceed boundaries set by the rules. In one embodiment, the summary reports may be integrated with general-ledger data (94) and other raw business data (74) via a relational database (72) to derive more accurate records of activity-based-costing information (76). Additionally, the data of the summary reports may be visualized in two- or three-dimensional representations of communication-flow patterns to illustrate in an intuitive and semantically scalable manner the desired level of detail for time and time-based expense consumed by the electronic interactions of an individual or organization.

Current US Original Classification (1):

709/227

Current US Cross Reference Classification (13):

709/219

Current US Cross Reference Classification (14):

709/232

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US006895438B1

(12) United States Patent
Ulrich(10) Patent No.: US 6,895,438 B1
(45) Date of Patent: May 17, 2005(54) TELECOMMUNICATION-BASED
TIME-MANAGEMENT SYSTEM AND
METHOD5,966,139 A 10/1999 Anupam et al. 345/440
5,987,516 A 11/1999 Rao et al. 709/227
5,991,365 A 11/1999 Pizano et al. 379/88.13(75) Inventor: Paul C. Ulrich, 355 The Promenade,
Edgewater, NJ (US) 07020

(73) Assignee: Paul C. Ulrich, Southbury, CT (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 822 days.

(21) Appl. No.: 09/655,681

(22) Filed: Sep. 6, 2000

(51) Int. Cl.⁷ G06F 15/16(52) U.S. Cl. 709/227; 709/219; 709/232;
707/1; 707/3; 707/6; 705/9; 704/201; 704/503;
455/66.1; 455/186.1; 455/566; 370/521;
370/522; 370/535; 345/716(58) Field of Search 709/219, 232,
709/204, 224, 227, 233; 707/1, 3, 6; 705/9;
704/201, 503; 455/66.1, 186.1, 566; 370/521,
522, 535, 328; 345/716; 379/120; 719/329;
235/382

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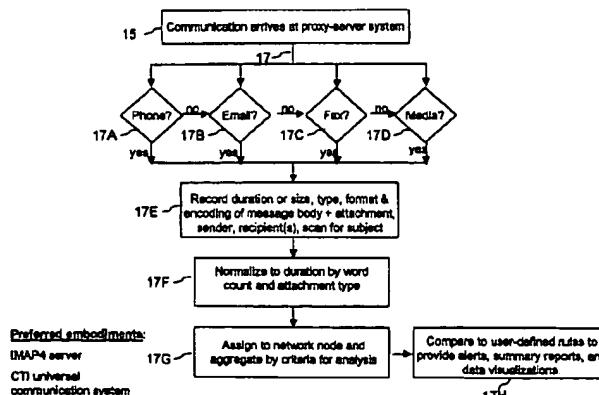
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Primary Examiner—Jack Harvey
Assistant Examiner—Hai V. Nguyen

(57) ABSTRACT

A proxy-server system (15) connected preferably to a computer-telephone system (10) intercepts, processes, and analyzes as traffic-analysis results (68A-C) all forms of real- and non-real-time electronic communication passing over the network in the form of raw traffic data (61). The proxy-server system normalizes each communication into the measure of time needed by recipient(s) of the communication to understand the information contained therein. Once normalized, the data may be aggregated into summary reports (69A-C). As part of the analysis, the aggregated communication records are compared with user-defined rules to provide alerts if the individual or aggregated durations exceed boundaries set by the rules. In one embodiment, the summary reports may be integrated with general-ledger data (94) and other raw business data (74) via a relational database (72) to derive more accurate records of activity-based-costing information (76). Additionally, the data of the summary reports may be visualized in two- or three-dimensional representations of communication-flow patterns to illustrate in an intuitive and semantically scalable manner the desired level of detail for time and time-based expense consumed by the electronic interactions of an individual or organization.

24 Claims, 15 Drawing Sheets



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L4: Entry 2 of 19

File: USPT

Jan 4, 2005

DOCUMENT-IDENTIFIER: US 6839751 B1

** See image for Certificate of Correction **

TITLE: Re-using information from data transactions for maintaining statistics in network monitoring

Abstract Text (1):

A method of and monitor apparatus for analyzing a flow of packets passing through a connection point on a computer network. The method includes receiving a packet from a packet acquisition device, and looking up a flow-entry database containing flow-entries for previously encountered conversational flows. The looking up to determine if the received packet is of an existing flow. Each and every packet is processed. If the packet is of an existing flow, the method updates the flow-entry of the existing flow, including storing one or more statistical measures kept in the flow-entry. If the packet is of a new flow, the method stores a new flow-entry for the new flow in the flow-entry database, including storing one or more statistical measures kept in the flow-entry. The statistical measures are used to determine metrics related to the flow. The metrics may be base metrics from which quality of service metrics are determined, or may be the quality of service metrics.

Current US Original Classification (1):

709/224

Current US Cross Reference Classification (1):

709/223

Current US Cross Reference Classification (2):

709/230

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US006839751B1

(12) **United States Patent**
Dietz et al.

(10) **Patent No.:** US 6,839,751 B1
(45) **Date of Patent:** Jan. 4, 2005

(54) **RE-USING INFORMATION FROM DATA TRANSACTIONS FOR MAINTAINING STATISTICS IN NETWORK MONITORING**

(75) **Inventors:** Russell S. Dietz, San Jose, CA (US); Joseph R. Maixner, Aptos, CA (US); Andrew A. Koppenhaver, Littleton, CO (US)

(73) **Assignee:** Hi/ln, Inc., Los Gatos, CA (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 728 days.

(21) **Appl. No.:** 09/608,126

(22) **Filed:** Jun. 30, 2000

Related U.S. Application Data

(60) Provisional application No. 60/141,903, filed on Jun. 30, 1999.

(51) **Int. Cl. 7** G06F 15/173

(52) **U.S. Cl.** 709/224; 709/223; 709/230

(58) **Field of Search** 709/223, 224, 709/231, 232, 230; 370/252, 231; 379/32; 704/43; 714/39; 340/825

(56) **References Cited**

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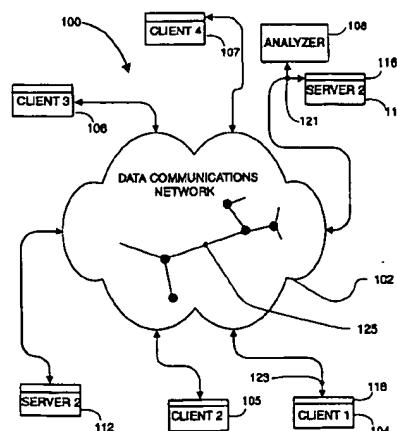
Primary Examiner—Thong Vu

(74) **Attorney, Agent, or Firm—Dov Rosenfeld; Inventek**

(57) **ABSTRACT**

A method of and monitor apparatus for analyzing a flow of packets passing through a connection point on a computer network. The method includes receiving a packet from a packet acquisition device, and looking up a flow-entry database containing flow-entries for previously encountered conversational flows. The looking up to determine if the received packet is of an existing flow. Each and every packet is processed. If the packet is of an existing flow, the method updates the flow-entry of the existing flow, including storing one or more statistical measures kept in the flow-entry. If the packet is of a new flow, the method stores a new flow-entry for the new flow in the flow-entry database, including storing one or more statistical measures kept in the flow-entry. The statistical measures are used to determine metrics related to the flow. The metrics may be base metrics from which quality of service metrics are determined, or may be the quality of service metrics.

21 Claims, 18 Drawing Sheets



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L4: Entry 3 of 19

File: USPT

Dec 7, 2004

DOCUMENT-IDENTIFIER: US 6829643 B1

TITLE: Network control apparatus having bandwidth control method selection associated to users utilizing status tables, ranking tables, and total points of user's information parameters

Abstract Text (1):

In a network control apparatus which can dynamically control a bandwidth corresponding to a traffic status of a user flexibly, when a whole traffic quantity of a packet passing through the network exceeds a threshold value, per-user-information is analyzed based on a database holding packet information, and a bandwidth control method in conformity with the result of the analysis is selected to perform/release the bandwidth control.

Current US Original Classification (1):

709/226

Current US Cross Reference Classification (1):

709/224

Current US Cross Reference Classification (2):

709/225

Current US Cross Reference Classification (3):

709/229

Current US Cross Reference Classification (4):

709/235

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US006829643B1

(12) **United States Patent**
Tobe et al.

(10) **Patent No.:** US 6,829,643 B1
(45) **Date of Patent:** Dec. 7, 2004

(54) **NETWORK CONTROL APPARATUS HAVING BANDWIDTH CONTROL METHOD SELECTION ASSOCIATED TO USERS UTILIZING STATUS TABLES, RANKING TABLES, AND TOTAL POINTS OF USER'S INFORMATION PARAMETERS**

(75) **Inventors:** Teruo Tobe, Kawasaki (JP); Hitoshi Ohura, Kawasaki (JP); Yoshiaki Suzuki, Kawasaki (JP); Kazuhiko Yanagidate, Kawasaki (JP); Hiroshi Kobayashi, Yokohama (JP)

(73) **Assignee:** Fujitsu Limited, Kawasaki (JP)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 753 days.

(21) **Appl. No.:** 09/716,775

(22) **Filed:** Nov. 20, 2000

(30) **Foreign Application Priority Data**

Feb. 1, 2000 (JP) 2000-024128

(51) **Int. Cl.:** G06F 15/173

(52) **U.S. Cl.:** 709/226; 709/224; 709/225; 709/229; 709/235

(58) **Field of Search** 709/200-310

(56) **References Cited**

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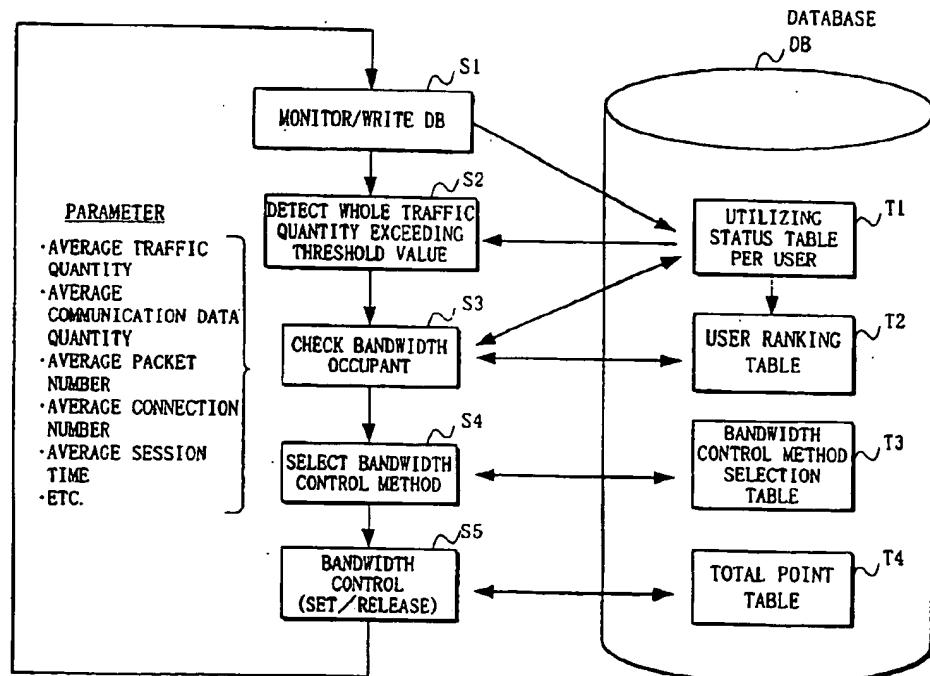
Primary Examiner—Nabil El-Hady

(74) **Attorney, Agent, or Firm:** Katten Muchin Zavis Rosenman

(57) **ABSTRACT**

In a network control apparatus which can dynamically control a bandwidth corresponding to a traffic status of a user flexibly, when a whole traffic quantity of a packet passing through the network exceeds a threshold value, per-user-information is analyzed based on a database holding packet information, and a bandwidth control method in conformity with the result of the analysis is selected to perform/release the bandwidth control.

7 Claims, 6 Drawing Sheets



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L4: Entry 4 of 19

File: USPT

Nov 30, 2004

DOCUMENT-IDENTIFIER: US 6826611 B1

TITLE: Apparatus and method for automatically obtaining a valid IP configuration in a local area network

Abstract Text (1):

A apparatus and method for automatically determining a valid IP configuration on a network analyzes traffic and determines valid subnets. A likely unused start IP address in a subnet is selected and checked to determine its availability. If not available, the start address is decremented, and tested again, until a valid address is obtained.

Current US Original Classification (1):

709/226

Current US Cross Reference Classification (7):

709/200

Current US Cross Reference Classification (8):

709/222

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US006826611B1

(12) **United States Patent**
Arndt

(10) **Patent No.:** US 6,826,611 B1
(45) **Date of Patent:** Nov. 30, 2004

(54) **APPARATUS AND METHOD FOR AUTOMATICALLY OBTAINING A VALID IP CONFIGURATION IN A LOCAL AREA NETWORK**

(75) Inventor: **Manfred R. Arndt, Folsom, CA (US)**

(73) Assignee: **Fluke Corporation, Everett, WA (US)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 641 days.

(21) Appl. No.: **09/676,631**

(22) Filed: **Sep. 30, 2000**

(51) Int. Cl.⁷ **G06F 15/173**

(52) U.S. Cl. **709/226; 709/200; 709/222; 707/10; 702/186; 702/188; 370/252; 370/253; 370/400**

(58) Field of Search **709/200, 222, 709/226; 707/10; 370/400, 252, 253; 702/186, 188**

(56) **References Cited**

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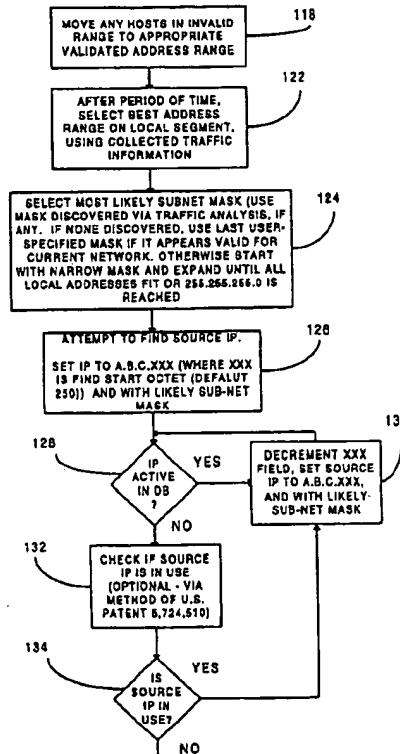
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Primary Examiner—Jack B. Harvey
Assistant Examiner—Hai V. Nguyen
(74) *Attorney, Agent, or Firm*—Dellett & Walters

(57) **ABSTRACT**

A apparatus and method for automatically determining a valid IP configuration on a network analyzes traffic and determines valid subnets. A likely unused start IP address in a subnet is selected and checked to determine its availability. If not available, the start address is decremented, and tested again, until a valid address is obtained.

20 Claims, 6 Drawing Sheets



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L4: Entry 5 of 19

File: USPT

May 11, 2004

DOCUMENT-IDENTIFIER: US 6735629 B1

TITLE: Method and apparatus for real-time protocol analysis using an active and adaptive auto-throttling CPU allocation front end process

Abstract Text (1):

In a probe system for monitoring and analyzing data flow and associated activities between devices connected in common to a point in a network, in the mode of operation, the probe's driver runs in a "Kernel mode" on Windows NT for analyzing in relatively low detail packets of data retrieved from the network, whereby programming is provided for operating the Kernel mode driver to monitor the rate of traffic or data packets entering an NIC card buffer, for causing the CPU to respond to an interrupt issued by the NIC everytime a data packet is received at a traffic rate below a predetermined threshold to access data packets entering the NIC card buffer, and to cause the CPU to respond to polling pulses at regular predetermined intervals to access 'data packets, when the traffic rate exceeds the predetermined threshold, for providing more CPU cycles to analyze the data packets. In another mode of operation, unanalyzed data packets are transferred to a frame memory for relatively detailed analysis via Expert Analyzer software operating the CPU in a User mode, whereby the amount of unanalyzed data in the frame memory is monitored for allocating the percent of CPU time available for Kernel mode processing in inverse relationship thereto.

Current US Original Classification (1):

709/224

Current US Cross Reference Classification (1):

709/223

Current US Cross Reference Classification (2):

709/228

Current US Cross Reference Classification (3):

709/233

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US006735629B1

(12) **United States Patent**
Cafarelli, III et al.

(10) Patent No.: **US 6,735,629 B1**
(45) Date of Patent: **May 11, 2004**

(54) **METHOD AND APPARATUS FOR REAL-TIME PROTOCOL ANALYSIS USING AN ACTIVE AND ADAPTIVE AUTO-THROTTLING CPU ALLOCATION FRONT END PROCESS**

(75) Inventors: **Dominick Anthony Cafarelli, III**,
Ossining, NY (US); **Daniel Hansen**,
Pompton Plains, NJ (US)

(73) Assignee: **Networks Associates Technology, Inc.**,
Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/565,021**

(22) Filed: **May 4, 2000**

(51) Int. Cl.⁷ **G06F 15/173; G06F 15/16**

(52) U.S. Cl. **709/224; 709/233; 709/228;**

709/223

(58) Field of Search **709/220, 223,**
709/234-236, 249, 201, 209, 225, 233

(56) **References Cited**

U.S. PATENT DOCUMENTS

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* cited by examiner

Primary Examiner—Ario Etienne

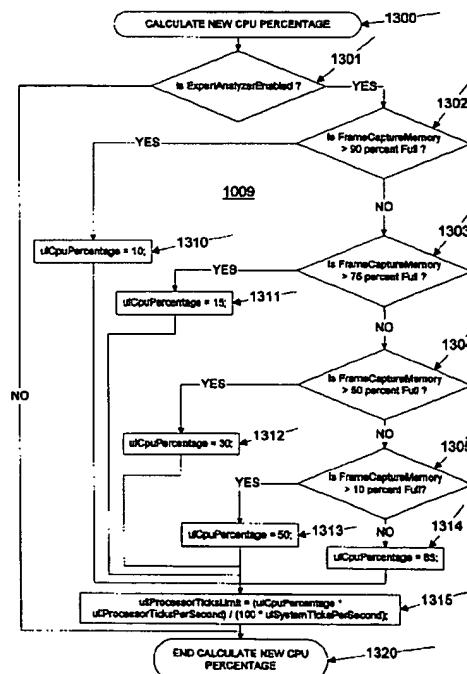
Assistant Examiner—Hussein Chanti

(74) *Attorney, Agent, or Firm*—Silicon Valley IP Group,
PC; Kevin J. Zilka; Christopher J. Hamaty

(57) **ABSTRACT**

In a probe system for monitoring and analyzing data flow and associated activities between devices connected in common to a point in a network, in the mode of operation, the probe's driver runs in a "Kernel mode" on Windows NT for analyzing in relatively low detail packets of data retrieved from the network, whereby programming is provided for operating the Kernel mode driver to monitor the rate of traffic or data packets entering an NIC card buffer, for causing the CPU to respond to an interrupt issued by the NIC everytime a data packet is received at a traffic rate below a predetermined threshold to access data packets entering the NIC card buffer, and to cause the CPU to respond to polling pulses at regular predetermined intervals to access data packets, when the traffic rate exceeds the predetermined threshold, for providing more CPU cycles to analyze the data packets. In another mode of operation, unanalyzed data packets are transferred to a frame memory for relatively detailed analysis via Expert Analyzer software operating the CPU in a User mode, whereby the amount of unanalyzed data in the frame memory is monitored for allocating the percent of CPU time available for Kernel mode processing in inverse relationship thereto.

30 Claims, 14 Drawing Sheets



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L4: Entry 5 of 19

File: USPT

May 11, 2004

DOCUMENT-IDENTIFIER: US 6735629 B1

TITLE: Method and apparatus for real-time protocol analysis using an active and adaptive auto-throttling CPU allocation front end process

Abstract Text (1):

In a probe system for monitoring and analyzing data flow and associated activities between devices connected in common to a point in a network, in the mode of operation, the probe's driver runs in a "Kernel mode" on Windows NT for analyzing in relatively low detail packets of data retrieved from the network, whereby programming is provided for operating the Kernel mode driver to monitor the rate of traffic or data packets entering an NIC card buffer, for causing the CPU to respond to an interrupt issued by the NIC everytime a data packet is received at a traffic rate below a predetermined threshold to access data packets entering the NIC card buffer, and to cause the CPU to respond to polling pulses at regular predetermined intervals to access data packets, when the traffic rate exceeds the predetermined threshold, for providing more CPU cycles to analyze the data packets. In another mode of operation, unanalyzed data packets are transferred to a frame memory for relatively detailed analysis via Expert Analyzer software operating the CPU in a User mode, whereby the amount of unanalyzed data in the frame memory is monitored for allocating the percent of CPU time available for Kernel mode processing in inverse relationship thereto.

Current US Original Classification (1):

709/224

Current US Cross Reference Classification (1):

709/223

Current US Cross Reference Classification (2):

709/228

Current US Cross Reference Classification (3):

709/233

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US006735629B1

(12) **United States Patent**
Cafarelli, III et al.

(10) Patent No.: **US 6,735,629 B1**
(45) Date of Patent: **May 11, 2004**

(54) **METHOD AND APPARATUS FOR REAL-TIME PROTOCOL ANALYSIS USING AN ACTIVE AND ADAPTIVE AUTO-THROTTLING CPU ALLOCATION FRONT END PROCESS**

(75) Inventors: **Dominick Anthony Cafarelli, III, Ossining, NY (US); Daniel Hansen, Pompton Plains, NJ (US)**

(73) Assignee: **Networks Associates Technology, Inc., Santa Clara, CA (US)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/565,021**

(22) Filed: **May 4, 2000**

(51) Int. Cl.⁷ **G06F 15/173; G06F 15/16**

(52) U.S. Cl. **709/224; 709/233; 709/228; 709/223**

(58) Field of Search **709/220, 223, 709/234-236, 249, 201, 209, 225, 233**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,740,380 A * 4/1998 LaBerge et al. 710/107
5,845,074 A * 12/1998 Kobata 709/219
5,966,381 A 10/1999 Buckley et al. 370/395

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Primary Examiner—Ario Etienne

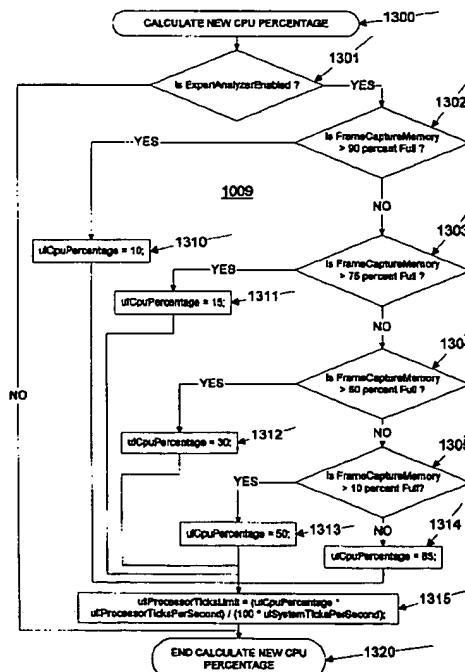
Assistant Examiner—Hussein Chanti

(74) *Attorney, Agent, or Firm*—Silicon Valley IP Group, PC; Kevin J. Zilka; Christopher J. Hamaty

(57) **ABSTRACT**

In a probe system for monitoring and analyzing data flow and associated activities between devices connected in common to a point in a network, in the mode of operation, the probe's driver runs in a "Kernel mode" on Windows NT for analyzing in relatively low detail packets of data retrieved from the network, whereby programming is provided for operating the Kernel mode driver to monitor the rate of traffic or data packets entering an NIC card buffer, for causing the CPU to respond to an interrupt issued by the NIC everytime a data packet is received at a traffic rate below a predetermined threshold to access data packets entering the NIC card buffer, and to cause the CPU to respond to polling pulses at regular predetermined intervals to access data packets, when the traffic rate exceeds the predetermined threshold, for providing more CPU cycles to analyze the data packets. In another mode of operation, unanalyzed data packets are transferred to a frame memory for relatively detailed analysis via Expert Analyzer software operating the CPU in a User mode, whereby the amount of unanalyzed data in the frame memory is monitored for allocating the percent of CPU time available for Kernel mode processing in inverse relationship thereto.

30 Claims, 14 Drawing Sheets



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L4: Entry 6 of 19

File: USPT

Mar 2, 2004

DOCUMENT-IDENTIFIER: US 6701380 B2

TITLE: Method and system for intelligently controlling a remotely located computer

Abstract Text (1):

A method and system for remotely accessing and controlling at least one of a target switch and a target computer using a target controller. The video information captured by the target controller is analyzed and compressed in order to reduce network traffic between the target controller and a controlling computer.

Current US Original Classification (1):

709/250

Current US Cross Reference Classification (1):

709/247

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US006701380B2

(12) **United States Patent**
Schneider et al.

(10) **Patent No.:** US 6,701,380 B2
(45) **Date of Patent:** Mar. 2, 2004

(54) **METHOD AND SYSTEM FOR INTELLIGENTLY CONTROLLING A REMOTELY LOCATED COMPUTER**

(75) **Inventors:** Walter J. Schneider, Brier, WA (US); Warren C. Jones, Renton, WA (US); Mark D. Sasten, Duvall, WA (US)

(73) **Assignee:** Avocent Redmond Corp., Redmond, WA (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** 10/365,441

(22) **Filed:** Feb. 13, 2003

(65) **Prior Publication Data**

US 2003/0135656 A1 Jul. 17, 2003

Related U.S. Application Data

(63) Continuation of application No. 09/682,761, filed on Oct. 15, 2001, now Pat. No. 6,539,418, which is a continuation of application No. 09/359,376, filed on Jul. 23, 1999, now Pat. No. 6,304,895, which is a continuation-in-part of application No. 08/916,685, filed on Aug. 22, 1997, now abandoned.

(51) **Int. Cl.:** G06F 13/00
(52) **U.S. Cl.:** 709/250; 709/247

(58) **Field of Search** 709/200, 201, 709/203, 217, 218, 219, 247, 250

(56) **References Cited**

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Primary Examiner—Moustafa M. Meky

(74) **Attorney, Agent, or Firm**—Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

(57) **ABSTRACT**

A method and system for remotely accessing and controlling at least one of a target switch and a target computer using a target controller. The video information captured by the target controller is analyzed and compressed in order to reduce network traffic between the target controller and a controlling computer.

9 Claims, 13 Drawing Sheets

